WHAT IS CLAIMED IS:

CLAIM 1. An ad-hoc radio system comprising:

a series of remote radio terminals each comprising a radio transceiver and a control processor, said control processor comprising software means for determining a routing path of a call;

at least one gateway in operative communication with at least some of said series of remote radio terminals;

a gateway controller in operative communication with said at least one gateway;

said gateway controller comprising a wide area network (WAN), call control and routing means for directing calls to a destination, and interconnecting means for connecting said WAN to an external network, whereby originating calls from a said radio terminal may be directed to a destination serviced by the external network and calls originating from the external network may be directed to a said radio terminal;

said call control and routing means comprising routing information means for directing an originating call from a said radio terminal to its destination via the intermediary of said at least one gateway and the external network, and for directing a call from an external network to a said radio terminal via said at least one gateway.

CLAIM 2. The ad ad-hoc radio system according to claim 1, wherein said interconnecting means comprises means for connecting said WAN to at least one of a: switched cellular network, a PSTN, and an Internet Service Provider (ISP).

CLAIM 3. The ad-hoc radio system according to claim 2, wherein said interconnecting means further comprises interfacing means for translating identifying information received from a switched cellular network and for translating identifying information received from said at least one gateway.

CLAIM 4. The ad-hoc radio system according to claim 1, in combination with at least one of a: switched cellular network, PSTN, and Internet Service Provider (ISP); said interconnecting means comprising means for connecting said WAN to at least one of said switched cellular network, PSTN, and Internet Service Provider (ISP).

CLAIM 5. The ad-hoc radio system according to claim 4, wherein said interconnecting means further comprises interfacing means for translating identifying information received from said switched cellular network, and for translating identifying information received from said at least one gateway for transmission to said switched cellular network.

CLAIM 6. The ad-hoc radio system according to claim 2, wherein said interconnecting means comprises a first connection means for connecting said WAN to the cellular switched network, and second connection means for connecting said WAN to the PSTN.

CLAIM 7. The ad-hoc radio system according to claim 2, wherein said interconnecting means comprises a first connection means for connecting said WAN to the cellular switched network, and second connection means for connecting said WAN to an Internet Service Provider.

CLAIM 8. In an ad-hoc radio system comprising a series of remote radio terminals, each said radio terminal comprising a radio transceiver and a control processor, at least one gateway in operative communication with at least some of said series of remote radio terminals, and a gateway controller in operative communication with said at least one gateway, a method of connecting an outgoing call from a radio terminal of the ad-hoc radio system, comprising:

    (a)   routing the outgoing call from the radio terminal to a gateway;

    (b)   delivering the call from the gateway to the gateway controller;

    (c)   connecting the call via the gateway controller to an external network.

CLAIM 9. The method of making an outgoing call from a radio terminal of an ad-hoc radio system according to claim 8, wherein said step (c) comprises:

    (d) connecting the outgoing call to one of a: switched cellular network, a PSTN, and an Internet Service Provider (ISP).

CLAIM 10. The method of making an outgoing call from a radio terminal of an ad-hoc radio system according to claim 8, further comprising before said step (a):

    (d)   registering the radio terminal with a gateway;

    (e)   said step (d) comprising determining a routing table for the path of connection to the gateway, and sending authentication information to the gateway.

CLAIM 11. The method of making an outgoing call from a radio terminal of an ad-hoc radio system according to claim 10, wherein said step (d) comprises:

    (f) transmitting registration identification information from the gateway to the radio terminal, whereby the radio terminal is uniquely identified.

CLAIM 12. In an ad-hoc radio system comprising a series of remote radio terminals each comprising a radio transceiver and a control processor, at least one gateway in operative communication with at least some of said series of remote radio terminals, and a gateway controller in operative communication with said at least one gateway, a method of receiving an incoming call from an network external to said ad-hoc radio system to a radio terminal of the ad-hoc radio system, comprising:

     (a)   transmitting the incoming call from the external network to the gateway controller;

     (b)   relaying the incoming call from the gateway controller to a gateway;

     (c)   routing the call from the gateway to the radio terminal.

CLAIM 13. The method of receiving an incoming call to a radio terminal of an ad-hoc radio system according to claim 12, wherein said step (a) comprises:

     (d) transmitting the incoming call from one of a: switched cellular network and a PSTN.

CLAIM 14. The method of receiving an incoming call to a radio terminal of an ad-hoc radio system according to claim 12, further comprising before said step (c):

     (d)   registering the radio terminal with a gateway;

     (e)   said step (d) comprising determining a routing table for the path of connection to the gateway, and sending authentication information to the gateway.

CLAIM 15. The method of receiving an incoming call from a radio terminal of an ad-hoc radio system according to claim 14, wherein said step (d) comprises:

(f) transmitting registration identification information from the gateway to the radio

terminal, whereby the radio terminal is uniquely identified.

CLAIM 16. The method of receiving an incoming call from a radio terminal of an ad-hoc radio

system according to claim 14, wherein before said step (d):

(f) said radio terminal listening to RTS/CTS communication signals transmitted by other

said radio terminals in its neighborhood over the reservation channel.

CLAIM 17. The method of receiving an incoming call from a radio terminal of an ad-hoc radio

system according to claim 16, wherein after said step (f) and before said step (d):

(g) said radio terminal sending out a request-to-register communication-signaling to

other said radio terminals in its neighborhood for determining the optimal gateway with which to

register.

CLAIM 18. The method of receiving an incoming call from a radio terminal of an ad-hoc radio

system according to claim 17, wherein said step (g) comprises:

(h) allowing enough time via a poll timer for said request-to-register communication-

signaling in order to receive back signaling from a plurality of other said radio terminals in its

neighborhood in order to allow exchange of routing information, and in order to provide the

capability of registering with a plurality of gateways, whereby said optimal gateway may be

selected.

CLAIM 19. The method of receiving an incoming call from a radio terminal of an ad-hoc radio system according to claim 18, wherein said step (h) comprises:

(i) resetting said toll timer continually until routing exchange information with at least one other said radio terminal allows establishment of communication with at least one gateway for allowing said step (d) to be performed.

CLAIM 20. In an ad-hoc radio system comprising a series of remote radio terminals each comprising a radio transceiver and a control processor for said transceiver, said control processor comprising memory means, each said radio terminal comprising software means for determining a routing path of a call made from said radio terminal or to be received by said radio terminal, said software means comprising means for establishing said radio terminal as one node in the routing path of another said radio terminal, the improvement comprising:

a plurality of gateways, each said gateway being in operative communication with at least some of said series of remote radio terminals;

a gateway controller in operative communication with said plurality of gateways;

said gateway controller comprising a wide area network (WAN), call control and routing means for directing calls to a destination, and interconnecting means for connecting said WAN to an external network, whereby originating calls from a said radio terminal may be directed to a destination serviced by the external network, and calls originating from the external network may be directed to a said radio terminal;

said call control and routing means comprising routing information means for directing an originating call from a said radio terminal to its destination via the intermediary of at least

one said gateway and the external network, and for directing a call from an external network to a said radio terminal via at least one said gateway.

CLAIM 21. The ad-hoc radio system according to claim 20, wherein said interconnecting means comprises means for connecting said WAN to at least one of a : switched cellular network, a PSTN, and an Internet Service Provider (ISP).

CLAIM 22. The ad-hoc radio system according to claim 21, wherein said interconnecting means further comprises interfacing means for translating identifying information received from an external network and for translating identifying information received from a said gateway.

CLAIM 23. The ad-hoc radio system according to claim 20, in combination with at least one of a: switched cellular network, PSTN, and Internet Service Provider (ISP); said interconnecting means comprising means for connecting said WAN to at least one of said switched cellular network, PSTN, and Internet Service Provider (ISP).

CLAIM 24. The ad-hoc radio system according to claim 23, wherein said interconnecting means further comprises interfacing means for translating identifying information received from said at least one of the switched cellular network, PSTN, and Internet Service Provider (ISP), and for translating identifying information received from said at least one gateway for transmission to said at least one of the switched cellular network, PSTN, and Internet Service Provider (ISP).

31

CLAIM 25. The ad-hoc radio system according to claim 21, wherein said interconnecting means comprises a first connection means for connecting said WAN to the cellular switched network, and second connection means for connecting said WAN to the PSTN.

CLAIM 26. The ad-hoc radio system according to claim 21, wherein said interconnecting means comprises a first connection means for connecting said WAN to the cellular switched network, and second connection means for connecting said WAN to an Internet Service Provider.

CLAIM 27. In a switched cellular network comprising a series of base stations, a mobile switching center (MSC), and remote radio terminals serviced by said base stations, the improvement comprising:

an ad-hoc radio system operatively connected to said MSC;

said ad-hoc radio system comprising a series of remote ad-hoc radio devices, at least one gateway with which at least some of said remote ad-hoc radio devices are registered and in communication, and a gateway controller;

said gateway controller comprising means for coupling said remote ad-hoc radio devices to said MSC of said switched cellular network, whereby an originating outgoing call made by a said remote ad-hoc radio device may be connected to a said remote radio terminal of said switched cellular network via said gateway controller and said MSC, and whereby an incoming call from a said remote radio terminal of said switched cellular network make be connected to a said remote ad-hoc radio device via said MSC and said gateway controller.

CLAIM 28. The improvement according to claim 27, wherein said ad-hoc radio system comprises a reservations channel and a plurality of data channels, said reservations channel providing communications between ad-hoc radio devices for establishing routing paths among ad-hoc radio devices and radio communications set up;

each said ad-hoc radio device comprising a processor, memory means, and software stored in said memory means;

said software means comprising first application means for determining a routing table for the path of connection to the gateway, and sending authentication information to the gateway; and

second application means for registering the respective said ad-hoc radio device with the said gateway.

CLAIM 29. The improvement claim 28, wherein said at least one gateway comprises third application means for transmitting registration identification information to the respective said ad-hoc radio device, whereby the ad-hoc radio device is uniquely identified.

CLAIM 30. The improvement according to claim 29, wherein software means comprises fourth application means for listening to RTS/CTS communication signals transmitted by other said ad-hoc radio device in its neighborhood over said reservation channel for use by said first application means.

CLAIM 31. The improvement according to claim 30, wherein said software means further comprises fifth application means for sending out request-to-register communication-signaling

33

to other said radio terminals in its neighborhood for determining the optimal gateway with which to register.